AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan
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FCC 15.225
13.56MHz Test Report

for

Elitegroup Computer Systems Co., Ltd.

No. 239, Sec. 2, TiDing Blvd,
Taipei, Taiwan 11493

Brand	**:**	**ECS**
Product Name	**:**	**12" Multi Function Pad**
Model Name	**:**	**mPAD-12……** **(The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\", "/" or blank for marketing use only)**
FCC ID	:	**WL6TC12A-W**

Prepared by: **: AUDIX Technology Corporation, EMC Department**

Testing Laboratory
1724

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AUDIX Technology Corp.
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TEST REPORT CERTIFICATION

Applicant	:	Elitegroup Computer Systems Co., Ltd.
Product Name	:	12" Multi Function Pad
Model No.	:	mPAD-12…… (The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\", "/" or blank for marketing use only)
Serial No.	:	N/A
Brand	:	ECS

Applicable Standards:

47 CFR FCC Part 15 Subpart C:2015
ANSI C63.10:2013

AUDIX Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report. *AUDIX Technology Corp.* does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Test: 2016. 06. 16 ~ 20 Date of Report: 2016. 06. 21

Producer: _____
(Annie Yu/Administrator)

Signatory: _____
(Jarwei Wang/Section Manager)

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1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2016. 06. 21	Original Report.	EM-F160348

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2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
15.225(a)(b)(c)	In-Band Emission	PASS
15.225(d)/15.209	Out-of-Band Emission	PASS
15.215 (c)	20dB Bandwidth	PASS
15.225(e)	Frequency Stability Tolerance	PASS

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3. GENERAL INFORMATION

3.1. Description of EUT

Product	12" Multi Function Pad
Model Number	mPAD-12…… (The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\", "/" or blank for marketing use only)
Test Model	mPAD-12-CHT4-I
Serial Number	N/A
Brand Name	ECS
Applicant	Elitegroup Computer Systems Co., Ltd. No. 239, Sec. 2., TiDing Blvd., Taipei, Taiwan 11493
RF Features	WLAN:802.11a/b/g/n/ac Bluetooth: BT and BLE NFC
Date of Receipt of Sample	2016. 05. 19

3.2. EUT Specifications Assessed in Current Report

Fundamental Range (MHz)	Channel Number	Modulation
13.56	1	ASK

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3.3. Description of Key Component Lists

Item	Supplier	Model / Type	Character
Main Board	ECS	TC71A	---
CPU (Socket: BGA1380)	Intel	Z8550	1.44GHz, up to 2.4GHz
Memory (On Board)	SK hynix	H9CCNNNBPTBL	LPDDR3 1600MHz 4GB
12” LCD Panel	Starry	20811220560001	.ZC-122A-0776AT
Touch Module	TOPGROUP EETI	ZC-122A-0776AT EXC3102	Support 10-points multi-touch(Capacivtive)
Storage	SandDisk	SDIN9DW4-32G	32GB
Front Camera	KINGCOME	O6P2-TC12A-WFHQ	Front Camera : 2.0M
Rear Camera	KINGCOME	O9B8-TC12A-WBHQ	Rear Camera: 8.0M
Wi-Fi +BT Module	Qualcomm (Azurewave)	QCNFA324 (AW-CM217NF)	Wi-Fi 802.11 a/b/g/n/ac + BT 4.0
GPS	Boradcam	BCM4752	GPS&GLONASS
NFC	NXP	NPC100	---
BATTREY	SUNWODA	TC12A-W	3.7Vdc,12600mAh / 46.62Wh
AC Adapter (Wall-mount, 2C)	Asian Power Devices Inc.	WA-36A12R	I/P: AC 100-240V, 50-60Hz, 0.9A Max. O/P: DC 12V, 3A
	DC Power Cord: Unshielded, Undetachable, 1.8m With one ferrite core		
mPad Module (Option)	ECS	Barcode Scanner mPAD	Barcode Scanner
	ECS	SCR mPAD	Smart Card Reader (SCR)
	ECS	MSR mPAD	Magnetic Stripe Reader (MSR)
	ECS	USB Ethernet mPAD	Giga LAN Port
12" Pad Docking (Option)	ECS	DOCKING mPAD-12	Docking

Remark: For more detailed features description, please refer to the manufacturer’s specifications or the user manual.

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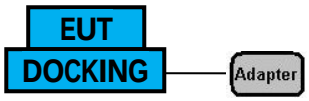
3.4. Setup Configuration

3.4.1. EUT Configuration for Power Line and Radiated Emission



3.4.2. EUT Configuration for Conducted Test Items

3.5. Operating Condition of EUT

To Set EUT on RF function under continues transmitting.

3.6. Description of Test Facility

Test Firm Name	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	**No. 8 Shielded Room** No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan **Semi-Anechoic Chamber** No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724
FCC OET Designation	:	TW1004 & TW1090

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3.7. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	± 3.5dB
Radiation Test (Distance: 3m)	9kHz-30MHz	± 2.3dB
	30MHz~1000MHz	± 4.7dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
20dB Bandwidth	± 0.2kHz
Frequency Stability	±0.78ppm

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4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Test Receiver	R&S	ESR3	101774	2016. 02. 04	2017. 02. 03
2.	A.M.N.	R&S	ENV4200	100169	2015. 11. 17	2016. 11. 16
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2015. 12. 23	2016. 12. 22
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2016. 01. 17	2017. 01. 16
5.	Test Software	Audix	e3	V.6.120424	N.C.R.	N.C.R.

4.2. .Radiated Emission Measurement

4.2.1. Frequency Range 9kHz~30MHz

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2015. 09. 14	2016. 09. 13
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 24	2016. 06. 23
3.	Loop Antenna	R&S	HFH2-Z2	891847/27	2015. 12. 24	2016. 12. 23
4.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.2.2. Frequency Range 30MHz~1000MHz

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2015. 09. 14	2016. 09. 13
2.	Test Receiver	R & S	ESCS30	100338	2015. 06. 24	2016. 06. 23
3.	Amplifier	HP	8447D	2944A06305	2016. 02. 23	2017. 02. 22
4.	Bilog Antenna	CHASE	CBL6112D	33821	2016. 01. 30	2017. 01. 29
5.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2015. 11. 28	2016. 11. 27
2.	Programmable Temperature & Humidity Chamber	GIANT	GTH-150-40 -CP-AR	MAA1505-008	2016. 05. 11	2017. 05. 10
3.	Transformer	TAILI	TL-220	N/A	N.C.R.	N.C.R.

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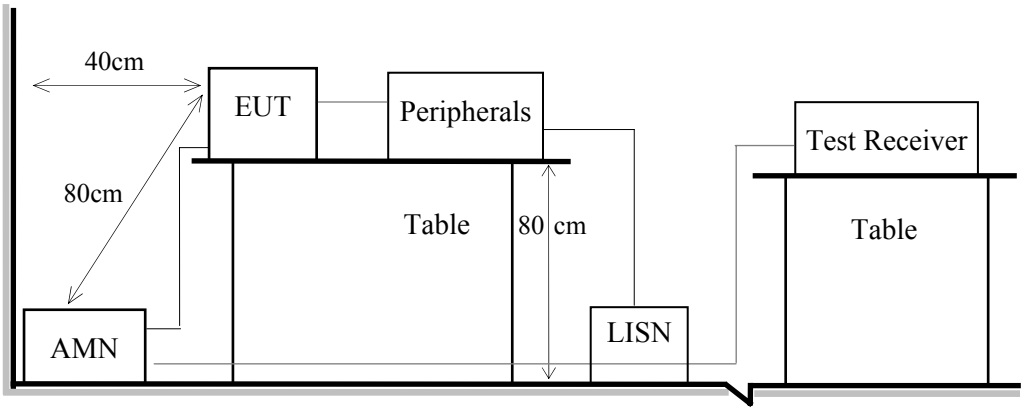
5. CONDUCTED EMISSION MEASUREMET

5.1. Block Diagram of Test Setup

Shielded Room Setup Diagram



Ground Plane

5.2. Power Line Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dBμV	56 ~ 46 dBμV
500kHz ~ 5MHz	56 dBμV	46 dBμV
5MHz ~ 30MHz	60 dBμV	50 dBμV

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.
2.: The lower limit applies to the band edges.

5.3. Test Procedure

5.3.1. To set up the EUT as indicated in ANSI C 63.10 The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.

5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).

5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)

5.3.4. Checking frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

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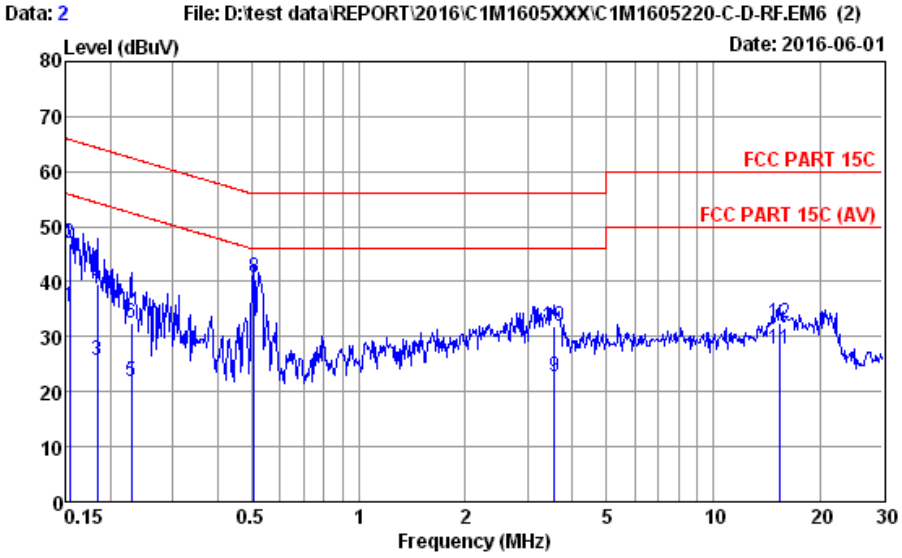
5.4. Conducted Emission Measurement Results

PASSED.

Test Date	2016/06/01	Temp./Hum.	25℃/60%
Test Voltage	AC 120V, 60Hz		



Site no. : No.8 Shielded Room
Data no. : 2
Condition : ENV4200 100169
Phase : NEUTRAL
Limit : FCC PART 15C
Env. / Ins. : 25°C / 60% ESR3 (1774)
Engineer : Tim
EUT : mPAD-12-CHT4-I
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.153	11.43	0.03	9.86	13.97	35.29	55.82	20.53	Average
2	0.153	11.43	0.03	9.86	25.63	46.95	65.82	18.87	QP
3	0.183	11.31	0.03	9.86	4.36	25.56	54.33	28.77	Average
4	0.183	11.31	0.03	9.86	18.32	39.52	64.33	24.81	QP
5	0.229	11.20	0.03	9.86	0.89	21.98	52.48	30.50	Average
6	0.229	11.20	0.03	9.86	11.30	32.39	62.48	30.09	QP
7	0.507	10.99	0.04	9.86	18.45	39.34	46.00	6.66	Average
8	0.507	10.99	0.04	9.86	19.95	40.84	56.00	15.16	QP
9	3.565	11.14	0.12	9.87	1.58	22.71	46.00	23.29	Average
10	3.565	11.14	0.12	9.87	10.71	31.84	56.00	24.16	QP
11	15.388	13.41	0.25	9.90	4.15	27.71	50.00	22.29	Average
12	15.388	13.41	0.25	9.90	8.93	32.49	60.00	27.51	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

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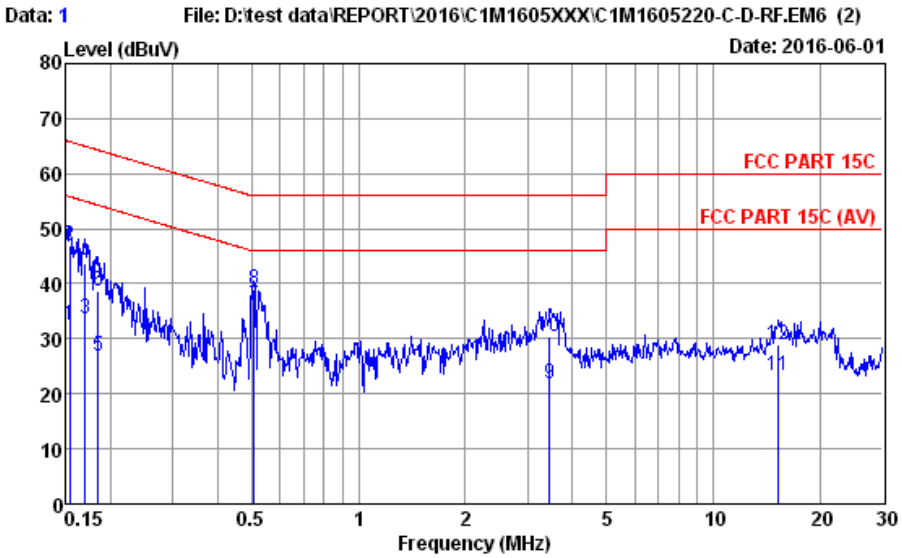
Test Date	2016/06/01	Temp./Hum.	25℃/60%
Test Voltage	AC 120V, 60Hz		



Site no. : No.8 Shielded Room
Data no. : 1
Condition : ENV4200 100169
Phase : LINE
Limit : FCC PART 15C
Env. / Ins. : 25°C / 60% ESR3 (1774)
Engineer : Tim
EUT : mPAD-12-CHT4-I
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.153	10.75	0.03	9.86	11.80	32.44	55.82	23.38	Average
2	0.153	10.75	0.03	9.86	26.19	46.83	65.82	18.99	QP
3	0.169	10.73	0.03	9.86	12.97	33.59	54.99	21.40	Average
4	0.169	10.73	0.03	9.86	23.09	43.71	64.99	21.28	QP
5	0.184	10.70	0.03	9.86	6.35	26.94	54.28	27.34	Average
6	0.184	10.70	0.03	9.86	18.05	38.64	64.28	25.64	QP
7	0.507	10.55	0.04	9.86	15.50	35.95	46.00	10.05	Average
8	0.507	10.55	0.04	9.86	18.42	38.87	56.00	17.13	QP
9	3.454	10.63	0.12	9.87	1.37	21.99	46.00	24.01	Average
10	3.454	10.63	0.12	9.87	9.71	30.33	56.00	25.67	QP
11	15.226	12.36	0.25	9.90	0.94	23.45	50.00	26.55	Average
12	15.226	12.36	0.25	9.90	6.36	28.87	60.00	31.13	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

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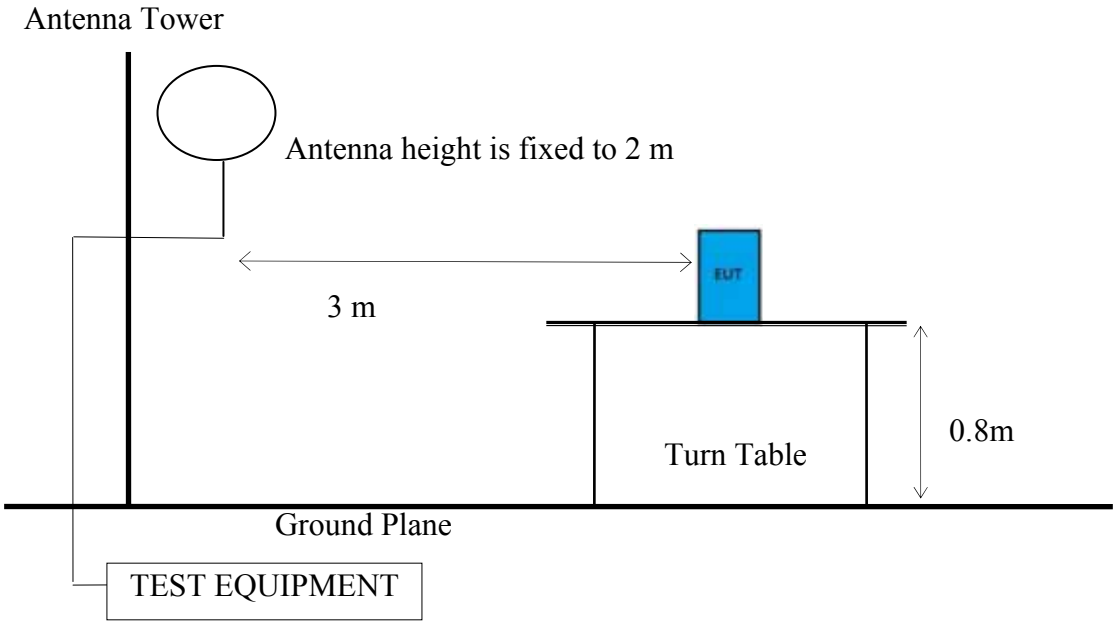
6. RADIATED SPURIOUS EMISSION MEASUREMENT (IN-BAND)

6.1. Block Diagram of Test Setup

6.1.1. Block Diagram of EUT

Indicated as section 3.4

6.1.2. Setup Diagram for 9kHz-30MHz



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6.2. IN-Band Radiated Spurious Emission Limits

Frequency (MHz)	Distance (m)	Limits	
		μV/m	dBμV/m
13.553-13.567	30	15848	84
	3	1584893	124
13.410 -13.553 and 13.567-13.710	30	334	50.50
	3	33381	90.50
13.110 -13.410 and 13.710-14.010	30	106	40.5
	3	10592	80.50

Remark：(1) dBμV/m = 20 log (μV/m)

(2) 15848uV/m= 84dBuV/m=84+40log(30m/3m)=124dBuV/m
334uV/m= 50.5dBuV/m=50.5+40log(30m/3m)=90.5dBuV/m
106uV/m= 40.5dBuV/m=40.5+40log(30m/3m)=80.5dBuV/m

6.3. Test Procedure

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 2 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4-2013 regulation.

Below 30MHz:

(1) RBW = 9kHz with peak and average detector.

(2) Detector: average and peak (10kHz-490kHz)
Q.P. (490kHz-30MHz)

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6.4. Test Results

PASSED.

Test Date	2016/06/20	Temp./Hum.	24℃/56%
Test Voltage	AC 120V, 60Hz		

Antenna at 0 Degree

Test Frequency (MHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
13.560	39.28	123.99	84.71	Peak

Antenna at 90 Degree

Test Frequency (MHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
13.560	37.29	123.99	86.70	Peak

Note:1. All emissions are lower than the ambient level cannot be measured.

2. The Peak value has been compliance with Q.P. limit, thus measurement with Q.P. is not needed.

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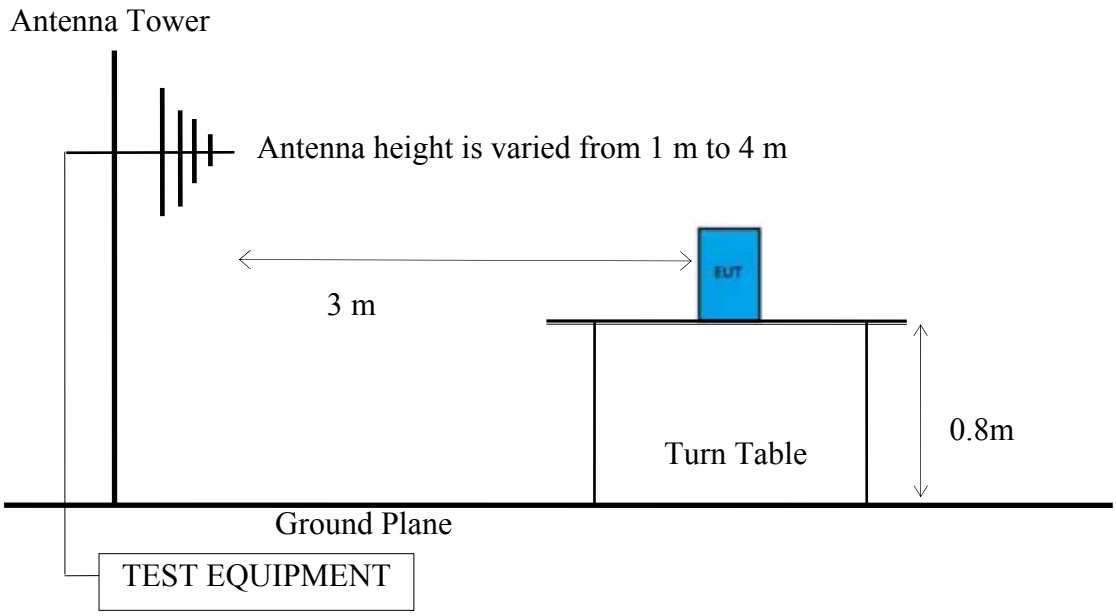
7. RADIATED SPURIOUS EMISSION MEASUREMENT (OUT-BAND)

7.1. Block Diagram of Test Setup

7.1.1. Block Diagram of EUT

Indicated as section 3.4

7.1.2. Setup Diagram for 30MHz-1000MHz



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7.2. Out-Band Radiated Spurious Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Field Strengths Limits	
		μV/m	dBμV/m
1.705 ~ 30	30 (3)	30 (2985)	29.54 (69.54)
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)
(2) The tighter limit applies to the edge between two frequency bands.
(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(4) Fundamental and emission fall within operation band are exempted from this section.
(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

7.3. Test Procedure

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 regulation.
Spectrum Analyzer is used for pre-testing with following setting:

(1) RBW = 120KHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.
(7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

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7.4. Measurement Result Explanation

■Emission Level=Antenna Factor + Cable Loss + Meter Reading

7.5. Test Results

PASSED.

Test Date	2016/06/20	Temp./Hum.	24℃/56%
Test Voltage	AC 120V, 60Hz		

7.5.1. Emissions within Restricted Frequency Bands

7.5.1.1. Frequency Range 9kHz~30MHz

Antenna at 0 Degree

Test Frequency (MHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
27.120	---Note	69.54	---	Peak

Antenna at 90 Degree

Test Frequency (MHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
27.120	---Note	69.54	---	Peak

Note:1. All emissions are lower than the ambient level cannot be measured.
2. The Peak value has been compliance with Q.P. limit, thus measurement with Q.P. is not needed.

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7.5.1.2. Frequency Range 30MHz ~ 1000MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
230.79	11.28	4.20	19.94	35.42	46.00	10.58	Peak
308.39	13.37	4.76	20.12	38.25	46.00	7.75	Peak
385.02	15.23	5.53	16.71	37.47	46.00	8.53	Peak
461.65	16.46	6.17	13.58	36.21	46.00	9.79	Peak
693.48	18.71	6.71	9.53	34.95	46.00	11.05	Peak
924.34	20.72	7.69	8.10	36.51	46.00	9.49	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
40.67	12.98	2.52	16.16	31.66	40.00	8.34	Peak
385.02	15.23	5.53	19.60	40.36	46.00	5.64	Peak
461.65	16.46	6.17	20.80	43.43	46.00	2.57	Peak
539.25	17.53	6.47	16.04	40.04	46.00	5.96	Peak
615.88	18.39	6.54	14.25	39.18	46.00	6.82	Peak
924.34	20.72	7.69	10.56	38.97	46.00	7.03	Peak

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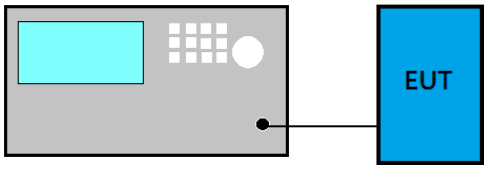
8. 20dB BANDWIDTH MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Specification Limits

The 20dB bandwidth shall be specified in operating frequency band.

8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r02:

■ Option 2

(1) Set RBW = 1% of Span.
(2) Set the video bandwidth (VBW) ≥ 3 × RBW.
(3) Detector = Peak.
(4) Trace mode = max hold.
(5) Sweep = auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

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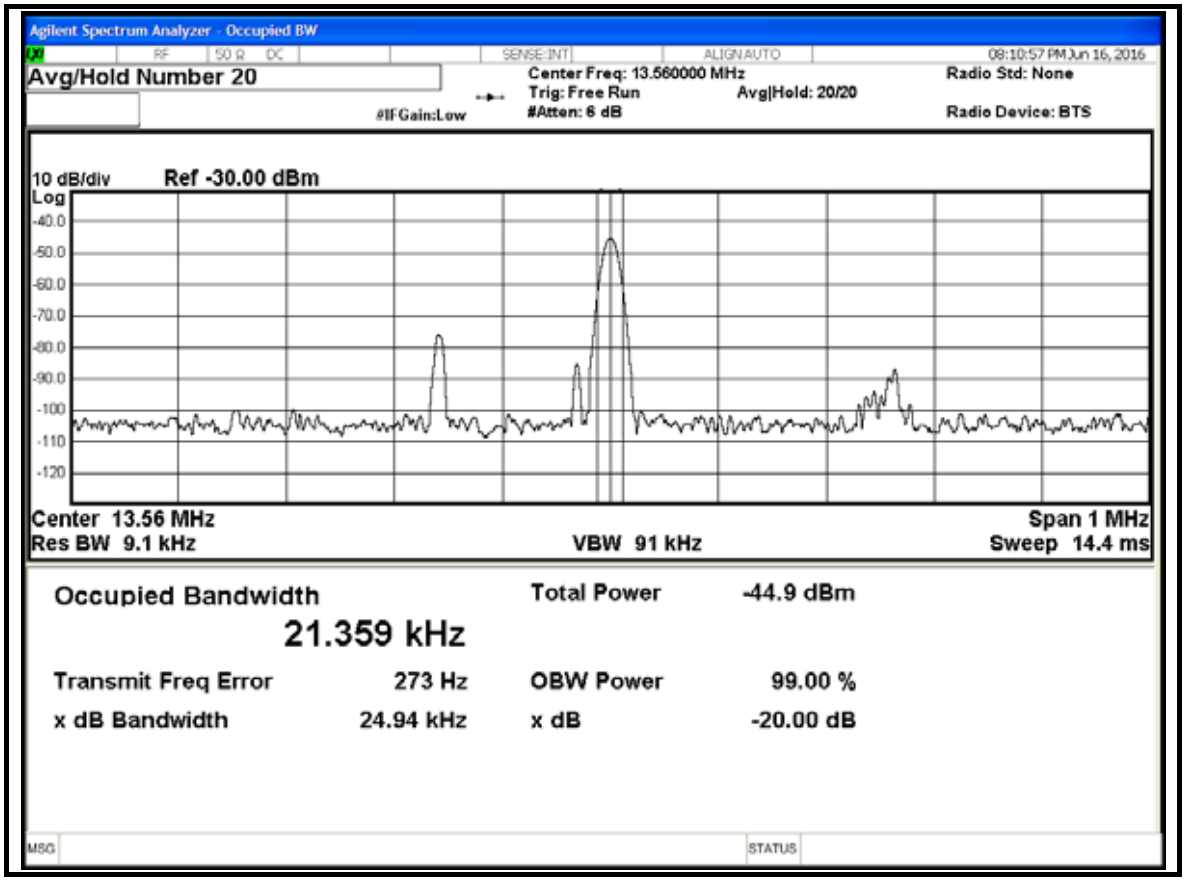
8.4. Test Results

Test Date	2016/06/16	Temp./Hum.	24℃/50%
Cable Loss	---	Test Voltage	DC 3.7V

8.4.1. 20dB Bandwidth Result

Centre Frequency (MHz)	20 dB Bandwidth (kHz)
13.56	24.94

8.4.2. Measurement Plots



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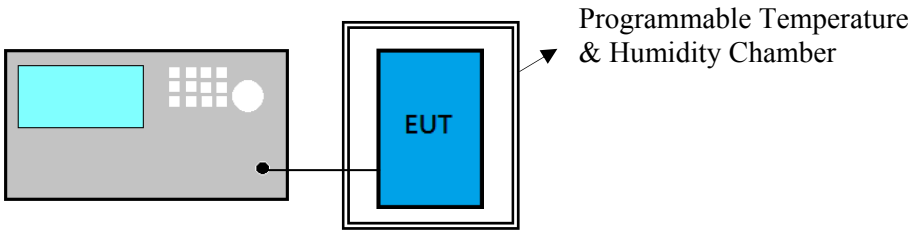
9. FREQUENCY STABILITY MEASUREMENT

9.1. Block Diagram of Test Setup



9.2. Specification Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degree C.

9.3. Test Procedure

The device operating in the 13.553-13.567MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to +50 degree C at normal supply voltage.

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9.4. Test Results

Test Date	2016/06/16	Temp./Hum.	24℃/50%
Cable Loss	---	Test Voltage	DC 3.7V

Test Mode: 2 Minute

Temperature(℃)	-20	-10	0	10	20
Voltage	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V	DC 4.225V
Frequency(MHz)	13.55957	13.55966	13.56743	13.55985	13.56992
Error (%)	-0.00317	0.00251	0.05479	-0.00111	0.07316

Temperature(℃)	20	30	40	50	20
Voltage	DC 3.145V	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V
Frequency(MHz)	13.55985	13.56121	13.56135	13.56139	13.56015
Error (%)	-0.00111	0.00892	0.00996	0.01025	0.00111

Test Mode: 5 Minute

Temperature(℃)	-20	-10	0	10	20
Voltage	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V	DC 4.225V
Frequency(MHz)	13.55856	13.55869	13.55878	13.55886	13.55899
Error (%)	-0.01062	-0.00966	-0.00900	-0.00841	-0.00745

Temperature(℃)	20	30	40	50	20
Voltage	DC 3.145V	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V
Frequency(MHz)	13.55892	13.56014	13.56018	13.56024	13.55912
Error (%)	-0.00796	0.00103	0.00133	0.00177	-0.00649

Test Mode: 10 Minute

Temperature(℃)	-20	-10	0	10	20
Voltage	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V	DC 4.225V
Frequency(MHz)	13.55957	13.55953	13.55961	13.55963	13.55972
Error (%)	-0.00317	-0.00347	-0.00288	-0.00273	-0.00206

Temperature(℃)	20	30	40	50	20
Voltage	DC 3.145V	DC 3.7V	DC 3.7V	DC 3.7V	DC 3.7V
Frequency(MHz)	13.55975	13.56013	13.56018	13.56025	13.55978
Error (%)	-0.00184	0.00096	0.00133	0.00184	-0.00162

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10. DEVIATION TO TEST SPECIFICATIONS

【NONE】